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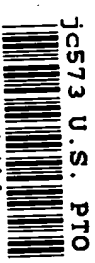
Appln. Trans.
PATENT



UTILITY PATENT APPLICATION TRANSMITTAL
(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. A31557-2826/57

First Named Inventor Philip G. Clark

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February 18, 1998

BY EXPRESS MAIL

Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

Sir:

Enclosed herewith for filing is a patent application of **PHILIP G. CLARK** entitled **TROUGHING IDLERS FOR BELT CONVEYORS**

which includes:

[X] Specification 25 Pages (includes 5 pages of claims and 1 page Abstract)
[X] Drawing(s) 4 Total Sheets
29 Total Pages
[X] Combined Declaration and Power of Attorney (2 pages)
[X] Newly executed (original or copy)
[ ] Copy from a prior application
(for continuation/divisional only - **must be filed to avoid surcharge for late filing)**

[ ] Continuation [ ] Divisional of prior application No. _ [ ] Continuation-In-Part (CIP)

[ ] An Assignment of the invention to
[] is attached. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
[] will follow.

[ ] Certified Copy of Priority Document(s) Country ____, No. ____, filed ____.

[X] Small Entity Statement(s)
[] Small Entity Statement filed in prior application. Status still proper and desired.

Attorney Docket No. A31557-2826/57

[ ] Information Disclosure Statement (IDS) PTO-1449
[ ] Copies of IDS Citations.

[X] Return Receipt Postcard

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The filing fee has been calculated as shown below:

FOR	(Col. 1) No.Filed			(Col. 2) No. Extra	Small Entity Rate	Fee	OR	Other Than A Small Entity Rate	Fee	
Basic Fee						$395				$
Total Claims	18	-20	=	0	x $11=	$0		x $22 =		$0
Ind. Claims	1	-3	=	0	x $41 =	$0		x $82 =		$0
Multiple Dependent Claim				0	+ $135 =	$0		+$270=		$0
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[X]	Basic filing fee	$395.00
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[X] A check in the amount of $395.00 to cover filing fee is enclosed.

[X] The Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR 1.16, 1.17, and 1.21(h) associated with this communication or credit any overpayment to Deposit Account No. 02-4377. Two copies of this sheet are enclosed

BAKER & BOTTS, L.L.P.

By _____
Thomas R. Nesbitt, Jr.

PTO Registration No. 22,075

Enclosures

TROUGHING IDLERS FOR BELT CONVEYORS

TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to belt conveyors and, more particularly, to troughing idlers that are particularly well-suited for use in enclosed belt conveyors.

BACKGROUND OF THE INVENTION

Hansen Manufacturing Corp. Of Sioux Falls, South Dakota, makes and sells enclosed belt conveyors under the trademark HI ROLLER™, in which the belt and the elements that support it are completely enclosed in a housing, which is usually called the "trunking." The trunking provides a structural support for troughing idlers, the belt and the material being conveyed, protects the material being conveyed by keeping out foreign substances and, in an outside installation, rain and snow, and keeps dust and any fugitive material that falls from the belt from entering the environment. The previously known HI ROLLER™ conveyors, which are in widespread use for conveying various materials, especially grains, have troughing idlers that resemble spools in that they have a body having a circular cylindrical medial surface and frusto-conical side surfaces that diverge outwardly from the medial surface. The belt nests in the body, which shapes the belt (in cross section) into a trough. The body is affixed to a shaft, the ends of which pass through holes in the side walls of the conveyor trunking and are supported in bearings located outside of the trunking. An important advantage of the spool-like troughing idlers is that the bearings are located outside of

the enclosure and are, therefore, not exposed to any dust produced by the materials being conveyed and are accessible for greasing from time to time. Also, the likelihood of any grease that might leak from a bearing entering the trunking and contaminating the material being conveyed is very small. Inasmuch as the body and shaft rotate, dust cannot build up on them, and there are no internal fixed frames or supporting elements for the spool-like idlers within the troughing where dust can accumulate. Should a bearing fail and overheat, it is not likely to be a source of ignition for a fire or detonation of the dusty atmosphere within the troughing by virtue of its isolation outside of the troughing.

Spool-like troughing idlers have the disadvantage of inherently producing slippage between the belt and the frusto-conical side surfaces of the body, which run at a surface speed that progressively increases as a function of the distance radially from the circular cylindrical medial portion. The slippage causes wear of the belt and the side surfaces of the idler, especially if the material being conveyed includes hard, abrasive particles that can stick to the belt.

There are many specific forms of troughing idlers in which both a medial horizontal roller and separate sloping

side rollers run at the same surface speeds, the rollers being of the same diameters and being mounted for rotation on separate shafts. In most designs, the rollers are tubular and supported by bearings within them that are carried by stationary shafts that are attached at opposite ends of the rollers to framing or stands. The shafts and frames are prone to buildups of dust. The bearings are close to the dusty environment of the belt, and if they fail and become highly heated, can ignite a fire. The foregoing shortcomings of previously known designs of three-roller type troughing idlers make them only marginally useful, at best, in enclosed belt conveyors, particularly for conveyors used for conveying grain where the environment is very dusty, the dust is highly flammable, and contamination is unacceptable.

SUMMARY OF THE INVENTION

Throughout this document, the terms "inboard" and "outboard" are used for convenience to locate the positions of various components relative to other components with respect to the longitudinal center of the path of a conveyor belt supported by the troughing idlers.

One object of the present invention is to provide troughing idlers in which all running surfaces travel at equal surface velocities, thus avoiding slippage anywhere between the belt and the idlers. Another object is to avoid having exposed portions of shafts and fixed frame members supporting the shafts where dust can collect. It also an object to make the bearings that support the rollers of troughing idlers accessible for lubrication from outside trunking that fully encloses the belt and the idler rollers. Yet another object is to isolate the bearings that support troughing idler rollers as much as possible from the interior of enclosed trunking so as to make contamination of the interior of the trunking by leaking lubricant and exposure of the enclosed interior to heat from failed bearings very unlikely.

The foregoing objects are attained, in accordance with the present invention, by a troughing idler installation that includes side supports located opposite each other with

respect to a space along which a conveyor belt moves along a belt path, a horizontal shaft extending across the space between the support members transversely to the belt path and having a medial roller affixed thereon, and antifriction bearings mounted on the side supports and supporting the horizontal shaft for rotation about a shaft axis. A side roller unit is supported exclusively by each side support member. Each side roller unit has a side roller carrier that includes a spindle, a hub, and inboard and outboard antifriction bearings interposed between the spindle and the hub, and a side roller supported in cantilevered relation with respect to the side support member by the side roller carrier for rotation about the spindle axis. The medial roller and the side rollers are arranged relative to each other so as to support the belt with side portions of the belt sloping upwardly and outwardly with respect to a horizontal medial portion of the belt.

The mounting of each side roller on the side support in cantilevered relation - each side roller is supported exclusively by a carrier unit mounted on the side support - eliminates any exposed shaft portion and a supporting frame for the side roller shaft located between the side supports in the space along which the belt runs on which dust and material that falls from the belt can collect. The

elimination of any stationary parts in the space between the side supports is especially important in enclosed belt conveyors, such as the HI ROLLER™ conveyors. In enclosed conveyors, virtually all dust and fugitive material falls to the floor of the trunking and is swept by the belt on its return run, in which it slides along the liner on the trunking floor, back to the tail end for return to the upper, delivery run of the belt by a reloader.

The specific design of the side roller carriers can vary considerably. In some designs of the side roller carriers, the spindle is affixed to the side support and the side roller is affixed to the hub. The spindle has an inner threaded end that is received within the hub and receives a retainer nut for the inner race of the inboard antifriction bearing. The inboard end of the hub is located inboard of the retainer nut and receives a hub cap for retaining a lubricant within the hub. The outboard end of the hub is located outboard of the outboard bearing, and a grease seal is interposed between the outboard end of the hub and the spindle to retain a lubricant within the hub. With the configuration described above, the hub cap at the inboard end of the hub prevents lubricant from leaking into the space inboard of the side support and prevents dust and fugitive material from entering the hub. If a bearing

should fail, the hub cap will retain any fragments of the bearing that might break loose and keep them from entering the belt space. Retention of fragments of failed bearings, which may be extremely hot, is of considerable importance in minimizing the chance of a failed bearing starting a fire or triggering a dust explosion in the conveyor.

Another advantage of a configuration in which the spindle is affixed to the support member and the hub is on the roller is the ability to locate the grease seal at the outboard end of the side roller carrier, which is at the highest point of the unit and will usually be outside of the space between the side supports. The high position minimizes the possibility of grease leaking from a worn or failed grease seal. The outboard location of the grease seal minimizes the possibility of leaking grease getting into the space and contaminating the material being conveyed.

The inboard and outboard antifriction bearings may be closely spaced apart and proximate to the side support member, in which case the spindle is relatively short, or they may be widely spaced apart on a spindle that extends along a major part of the length of the side roller shell. In the former case, the antifriction bearings are located as remotely as possible from the belt. A consideration here

again is with a bearing failure and the resulting heat. Having the bearings remote from the belt and the dusty environment of the belt reduces the chance of a fire in enclosed belt conveyors used to convey grain, for example. A trade-off for a short spindle and closely spaced bearings is a greater overhung moment and higher bearing loads. A relatively longer spindle/hub results in lower bearing loads. The isolation of the bearings in the hub and a hub cap for containment of bearing fragments and exclusion of dust from the hub offers a high degree of assurance that a failed bearing will not cause a fire.

In a configuration in which a long spindle/hub and widely spaced bearings are provided, it is advantageous, for further isolation of the bearings, to provide a roller shell that is spaced apart radially from the hub and supported concentrically with the hub by annular rings. The dead air space between the hub and the roller shell is a thermal barrier to heat transfer from a failed bearing to the shell.

For economy of manufacture and minimizing bearing loads, it is advantageous to make the side roller as a tubular shell. For further thermal isolation of the bearings from a dusty environment, a dust cap should be affixed in the inboard end of the shell. When the troughing idlers of the present invention are used in an enclosed belt

conveyor, a dust seal should be incorporated between the side roll shell or the hub and an element, such as the side support or a bracket by which the side roll carrier is mounted on the side support, to keep dust from leaking from the trunking.

Another configuration for the side roll carrier is to affix the hub to the side support member, preferably to the outboard side, and the spindle to the side roller. The spindle may have a threaded outboard end, onto which a retainer nut is threaded to retain the outboard antifriction bearing on the spindle. The hub has an outboard end located outwardly of the outboard bearing and the side roller unit further includes a hub cap on the outboard end of the hub to retain a lubricant within the hub. A grease seal is installed between the hub and the spindle inboard of the inboard antifriction bearing. The side roller has a tubular shell and a dust cap is affixed in the inboard end of the shell.

A design of the configuration just described has the advantages of simplicity and economy. Also, the roller carrier is outboard of the support and away form the dusty environment. Those advantages may not, however, outweigh an inherent large overhung moment - high bearing loads - and the location of the grease seal at the inboard side of the

bearing where a failure can allow grease to leak into the inboard side of the side support and into the material being conveyed.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and additional preferred features, and the advantages thereof, reference may be made to the following written description of exemplary embodiments, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a pictorial schematic view of a prior art enclosed belt conveyor, a portion of the trunking being broken away;

Fig. 2 is a schematic end cross-sectional view of the enclosed belt conveyor shown in Fig. 1;

Fig. 3 is an end elevational view of a trunking section of an enclosed belt conveyor that is equipped with troughing idlers according to the present invention;

Fig. 4 is a partial side elevational view of the trunking section of Fig. 3;

Fig. 5 is a side cross-sectional view, in generally schematic form, of a first embodiment of a side roller unit of a troughing idler embodying the present invention;

Fig. 6 is a side cross-sectional view, in generally schematic form, of a second embodiment of a side roller unit of a troughing idler embodying the present invention; and

Fig. 7 is a a side cross-sectional view, in generally schematic form, of a third embodiment of a side roller unit of a troughing idler embodying the present invention.

DESCRIPTION OF THE EMBODIMENTS

An exemplary embodiment of the present invention and its advantages are best understood by referring to FIGURES 1 to 7 of the drawings, like numerals being used for like and corresponding parts of the various FIGURES. The teachings of the present specification may be used to advantage in troughing idlers of various configurations.

A belt conveyor in which the present invention is useful to considerable advantage and which is well-known, per se, has an elongated trunking 10 that extends the entire length of the conveyor from a tail end 12 to a head end 14. The trunking 10 is essentially a hollow duct-like enclosure fabricated of steel sheet or plate stock in which all components of the conveyor other than bearings (see below), a drive motor 16, and a power transmission 18 driven by the motor are located. The trunking protects the material being conveyed from the environment and the environment from the material. Ordinarily, the trunking of enclosed belt conveyors is of modular construction, consisting of identical rectangular sections 10S that are bolted together end to end along end flanges 10f (see Fig. 3 and 4). The covers 19 of each section 10S of the trunking are fastened to the upper edges of the side walls by clips 19c.

An endless belt 20 is trained at the tail end 12 around a tail pulley (not shown), which is supported by bearings 22, and at the head end by a driven head pulley 24 (not shown), which is supported by bearings 26 and is driven by the motor and drive 16 and 18. The belt 20 carries material M (see Fig. 2) supplied at the tail end in a suitable manner along an upper run, along which the belt is supported by spool-like troughing idlers 28 that are journaled in bearings 30 installed outside the side walls 32 of the trunking 10. The tension in the belt is adjusted by an adjuster section 34. The belt 20 returns to the tail end 12 by sliding along the floor 36 of the trunking, which is lined with liner sheets 38 of a rigid low friction polymeric material, such as ultra high molecular weight polyethylene. The liner sheets 38 are substantially coextensive with the trunking floor, except for small gaps where the sheets meet end to end. One or two liner sheets are provided in each section of modular trunking. The sliding of the belt along the trunking floor continuously sweeps dust and material that falls from the upper run of the belt 20 back to the tail end 12, where known devices return it to the upper run for conveyance to the discharge location of the conveyor. Various discharge devices are used with enclosed belt

conveyors, some of which include stationary tripper valves for diverting the flow.

As discussed above, troughing idlers according to the present invention may be used to particular advantage in enclosed belt conveyors, such as the one shown in Fig. 1 and 2. The troughing idlers of the present invention are supported solely from the side wall 32 of the trunking.

In the embodiment shown in Figs. 3 and 4, a medial roller 40 in the form of a tubular shell is affixed to a horizontal shaft 42, the end portions of which pass through the side walls 32 of the toughing section and seals 43 and are supported by antifriction bearings 44 that are fastened to the side walls. A side roller unit 46 is mounted in each side wall 32. Each unit 46 includes a side roller carrier 48 that has a spindle 50, a hub 52, and inboard and outboard antifriction bearings 54 and 56 interposed between the spindle and the hub. The side roll carrier is attached to the trunking wall 32 by a bracket 57 and supports a side roller 58 in cantilevered relation with respect to the trunking side wall 32 for rotation about the axis of the spindle 50. The medial roller 40 and the side rollers 58 are arranged relative to each other so as to support the belt 20 with side portions 20s sloping upwardly and outwardly with respect to a medial portion 20m. The axes of

rotation of the side rollers 58 lie in a vertical plane perpendicular to the longitudinal axis of the trunking section 10S and slope downwardly and inwardly from the side walls 32 at an angle that may vary within a wide range, a range of from 20° to 45° being common. The side rollers 58 are spaced apart a small distance longitudinally from the medial roller 40 (see Fig. 4), which allows the lower ends of the side rollers 58 to overlap the end portions of the medial roller 40 in end elevation, thus enabling the belt to be fully supported across its lateral extent.

The side roller unit 100 shown in Fig. 5 has a very short spindle 102 that is attached to a bracket 104 by a nut 106 that is threaded onto the threaded outboard end of the spindle. The bracket 104 has a circular cylindrical tubular side wall 104s, which is vented through a vent slot 104v so that clean air surrounds the hub and bearings for a safe environment. A mounting plate 104m with an elliptical hole receives and is affixed to the side wall 104s of the bracket and is bolted (bolts not shown) to the trunking side wall 32.

The spindle 102 carries a hub 108, which has an internal rib 110 to form shoulders for the outer races of an inboard antifriction bearing 112 and an outboard antifriction bearing 114. The inner races are received on

the spindle 102 and held in place between a shoulder 102s on the spindle and a retainer nut/washer 116 threaded onto the threaded inboard end of the spindle. The inboard end of the hub 108 lies inboard of the inboard bearing 112 and receives a hub cap 118, which captures a lubricant supplied through a lubricant passage 120 and grease fitting 122 within the hub, prevents particles from escaping from within the hub (e.g., hot pieces of a failed bearing), and keeps dust out of the hub. A grease seal 124 is received between the outboard end of the hub 108 and the spindle 102.

The hub 108 is press-fit (or otherwise suitably connected) to a side roller shell 126. A dust seal 128 keeps dust from within the trunking 10 from escaping from the trunking into the annular space between the shell 126 and the side wall 104s of the bracket. A dust cap 130 keeps dust from entering and collecting inside the shell.

A stationary spindle may be of any desired length, as the side roller unit 200 of Fig. 6 shows. The unit 200 is similar to the unit 100 of Fig. 5. Hence, the same reference numerals as used in Fig. 5, but increased by 100, are applied to Fig. 6, and the description of the unit 100 of Fig. 5 applies in most respects to the unit 600 of Fig. 6. One will observe a different form of mounting bracket 204, the more widely spaced antifriction bearings 212 and

214, a dust seal 228 secured to the bracket, and the connection of the hub 208 to the roller shell 226 by annular rings 232 and 234.

Fig. 7 shows a side roll unit 300 (the same reference numerals are used in Fig. 7 as in Fig. 5, but increased by 200) in which the hub 308 is affixed to the outboard side of the bracket 304, such as by bolting side flanges (not shown) on the hub to the bracket, and is thus stationary, and the spindle 302 is affixed to the roller shell 336. The structure and function of the unit 300 can be fully understood from the foregoing description of the unit 100 of Fig. 5 and the drawing figure.

WHAT IS CLAIMED IS:

1. A troughing idler installation comprising

side supports located opposite each other with respect to a space along which a conveyor belt moves along a belt path;

a horizontal shaft extending across the space between the side supports transversely to the belt path and having a medial roller affixed thereon;

antifriction bearings mounted on the side supports and supporting the horizontal shaft for rotation about a shaft axis; and

a side roller unit supported exclusively by each side support member, each side roller unit having

a side roller carrier that includes a spindle, a hub, and inboard and outboard antifriction bearings interposed between the spindle and the hub, and

a side roller supported in cantilevered relation with respect to the side support member by the side roller carrier about a spindle axis;

the medial roller and the side rollers being arranged relative to each other so as to support the belt with side portions of the belt sloping upwardly and outwardly with respect to a medial portion of the belt.

2. A troughing idler installation according to claim 1 wherein the spindle is affixed to the side support and the side roller is affixed to the hub.

3. A troughing idler installation according to claim 2 wherein the spindle has an inner threaded end that is received within the hub and receives a retainer nut for the inboard antifriction bearing.

4. A troughing idler installation according to claim 3 wherein the hub has an inboard end located inboard of the retainer nut with respect to the inboard antifriction bearing and receiving a hub cap for retaining a lubricant within the hub.

5. A troughing idler installation according to claim 3 wherein the hub has an outboard end located outwardly of the outboard bearing, and the side roller unit further includes a grease seal between the outboard end of the hub and the spindle to retain a lubricant within the hub.

6. A troughing idler installation according to claim 3 wherein the inboard and outboard antifriction bearings are

closely spaced apart and proximate to the side support member.

7. A troughing idler installation according to claim 6 wherein the side roller has a circular cylindrical shell and a dust cap is affixed in the inboard end of the shell.

8. A troughing idler installation according to claim 7 wherein the support member is a side wall of a trunking of an enclosed belt conveyor, and the spindle is affixed to a mounting bracket received in an opening in the trunking side wall.

9. A troughing idler installation according to claim 8 wherein the mounting bracket includes a sleeve surrounding an outboard end portion of the shell and the side roller unit includes a dust seal interposed between the sleeve and the shell.

10. A troughing idler installation according to claim 5 wherein the spindle and the hub are elongated and are coextensive with a major portion of the side roller, and the inboard and outboard antifriction bearings are widely spaced apart on the spindle.

11. A troughing idler installation according to claim 10 wherein the side roller has a tubular shell, the shell is spaced apart radially from the hub, and spaced apart annular discs join the shell to the hub.

12. A troughing idler installation according to claim 1 wherein the hub is affixed to the side support member and the spindle is affixed to the side roller.

13. A troughing idler installation according to claim 12 wherein the hub is affixed to the outboard side of the the support member.

14. A troughing idler installation according to claim 13 wherein the spindle has a threaded outboard end and a retainer nut is threaded onto the outboard end and retains the outboard antifriction bearing on the spindle and prevents the spindle from sliding axially downwardly through the bearings.

15. A troughing idler installation according to claim 14 wherein the hub has an outboard end located outwardly of the outboard bearing and the side roller unit further includes a

hub cap on the outboard end of the hub to retain a lubricant within the hub.

16. A troughing idler installation according to claim 15 wherein the side roller unit includes a grease seal between the hub and the spindle inboard of the inboard antifriction bearing.

17. A troughing idler installation according to claim 16 wherein the side roller has a tubular shell and a dust cap is affixed in the inboard end of the shell.

18. A troughing idler installation according to claim 16 wherein the support member is a side wall of a trunking of an enclosed belt conveyor.

TROUGHING IDLERS FOR BELT CONVEYORS

ABSTRACT OF THE DISCLOSURE

A troughing idler of an enclosed belt conveyor has a horizontal shaft that is supported by antifriction bearings mounted outside of the side walls of the trunking and carries a medial roller. Each of the side walls of the trunking supports a downwardly and inwardly sloping side roller in cantilevered relation by means of a side roller carrier that is mounted on the side wall and includes a spindle, a hub, and inboard and outboard antifriction bearings interposed between the spindle and the hub. The medial roller and the side rollers are arranged relative to each other so as to support the belt with side portions sloping upwardly and outwardly with respect to a medial portion.

COMBINED DECLARATION AND POWER OF ATTORNEY

(Original, Design, National Stage of PCT or CIP Application)

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TROUGHING IDLERS FOR BELT CONVEYORS

the specification of which: *(complete (a), (b) or (c) for type of application)*

Regular or Design Application

(a) [X] is attached hereto.
(b) [ ] was filed on as Application Serial No. and was amended on *(if applicable).*

PCT Filed Application Entering National Stage

(c) [ ] was described and claimed in International Application No. filed on and was amended on *(if applicable).*

Acknowledgment of Review of Papers and Duty of Candor

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of the subject matter claimed in this application in accordance with Title 37, Code of Federal Regulations § 1.56.

[ ] In compliance with this duty there is attached an information disclosure statement. 37 CFR 1.97.

Priority Claim

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed

(complete (d) or (e))

(d) [X] no such applications have been filed.
(e) [ ] such applications have been filed as follows:

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION			
COUNTRY APPLICATION NO.	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
			[ ] YES NO [ ]
			[ ] YES NO [ ]
			[ ] YES NO [ ]
ALL FOREIGN APPLICATION[S], IF ANY, FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION			
			[ ] YES NO [ ]
			[ ] YES NO [ ]
			[ ] YES NO [ ]

Claim for Benefit of Prior U.S. Provisional Application(s)

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

Provisional Application Number	Filing Date

Continuation-In-Part

(complete this part only if this is a continuation-in-part application)

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (Filing Date) (Status) (patented, pending, abandoned)

(Application Serial No.) (Filing Date) (Status) (patented, pending, abandoned)

Power of Attorney

As a named inventor, I hereby appoint Dana M. Raymond, Reg. No. 18,540; Frederick C. Carver, Reg. No. 17,021; Francis J. Hone, Reg. No. 18,662; Joseph D. Garon, Reg. No. 20,420; Arthur S. Tenser, Reg. No. 18,839; Ronald B. Hildreth, Reg. No. 19,498; Thomas R. Nesbitt, Jr., Reg. No. 22,075; Robert Neuner, Reg. No. 24,316; Richard G. Berkley, Reg. No. 25,465; Richard S. Clark, Reg. No. 26,154; Bradley B. Geist, Reg. No. 27,551; James J. Maune, Reg. No. 26,946; John D. Murnane, Reg. No. 29,836, Henry Tang, Reg. No. 29,705, Robert C. Scheinfeld, Reg. No. 31,300, John A. Fogarty, Jr., Reg. No. 22,348, Louis S. Sorell, Reg. No. 32,439 and Rochelle K. Seide Reg. No. 32,300 of the firm of BAKER & BOTTS, L.L.P., with offices at 30 Rockefeller Plaza, New York, New York 10112, as attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith

SEND CORRESPONDENCE TO:	DIRECT TELEPHONE CALLS TO:
BAKER & BOTTS, L.L.P. 30 ROCKEFELLER PLAZA, NEW YORK, N.Y. 10112	BAKER & BOTTS, L.L.P. (212) 705-5000

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF SOLE OR FIRST INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME	
	CLARK	**PHILIP**	**G.**	
RESIDENCE & CITIZENSHIP	CITY	STATE or FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	Hartford	South Dakota	United States	
POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE or COUNTRY	ZIP CODE
	46256 266th Street	Hartford	South Dakota	57033
DATE 9/17/98	SIGNATURE OF INVENTOR Philip G Clark			

EXPRESS #EE053815682 US

Attorney's Docket No. A31557-2826/57
Baker & Botts, L.L.P.

Applicant or Patentee: Philip G. Clark
Serial or Patent No.: _____ Filed or Issued: _____
For: TROUGHING IDLERS FOR BELT CONVEYORS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

[ ] the owner of the small business concern identified below:
[X] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN HANSEN MANUFACTURING CORP.

ADDRESS OF CONCERN 5100 West 12th Street, Sioux Falls, South Dakota 57107-0514

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled TROUGHING IDLERS FOR BELT CONVEYORS by inventor(s) Philip G. Clark described in

[X] the specification filed herewith
[ ] Application Serial No. _____, filed _____.
[ ] Patent No. __, issued __.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).
*Note: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME _____
ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

Baker & Botts, L.L.P.

Attorney's Docket No. A31557-2826/57

NAME _____

ADDRESS _____

[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Philip G. Clark

TITLE OF PERSON OTHER THAN OWNER C.E.O.

ADDRESS OF PERSON SIGNING _____

SIGNATURE Philip G Clark DATE 2/17, 1998

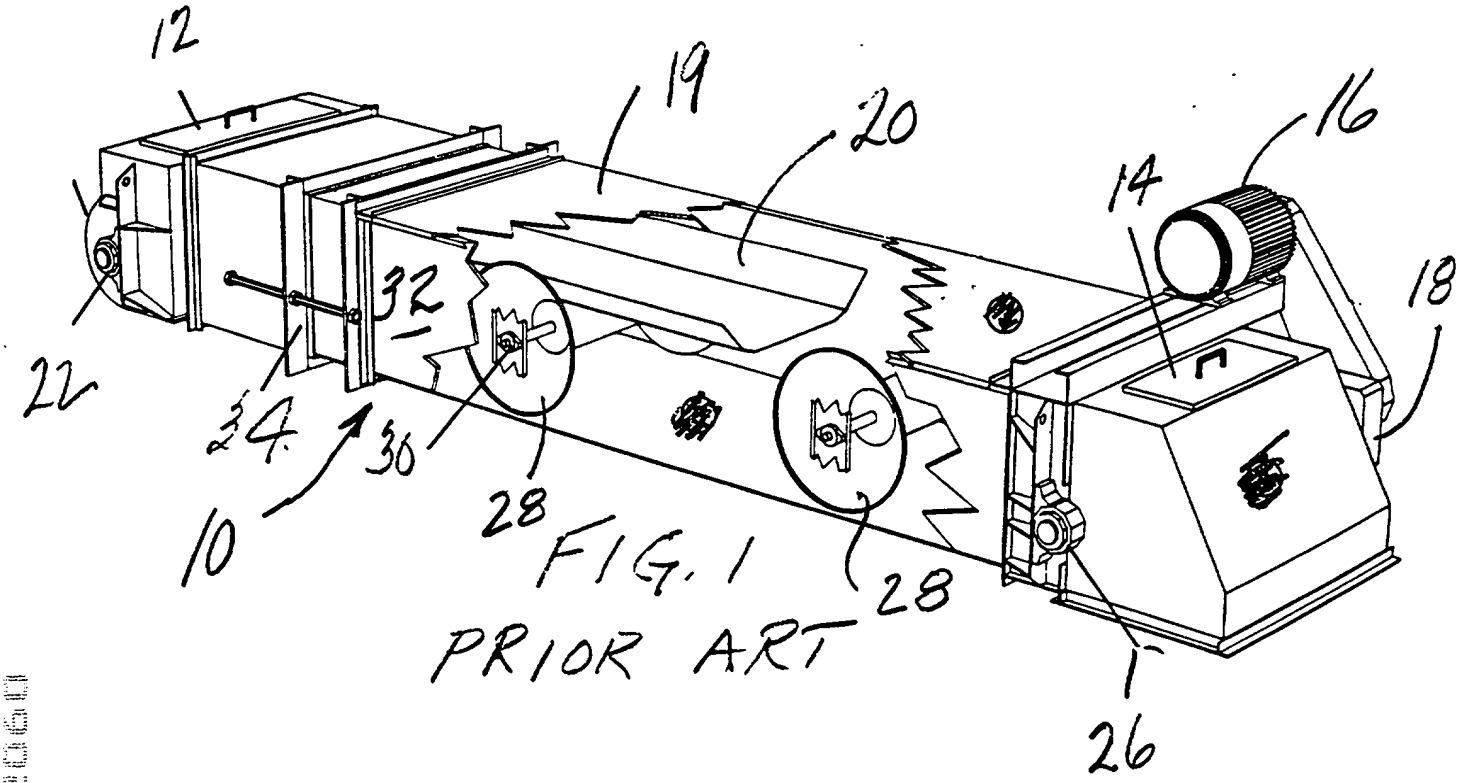


FIG. 1
PRIOR ART

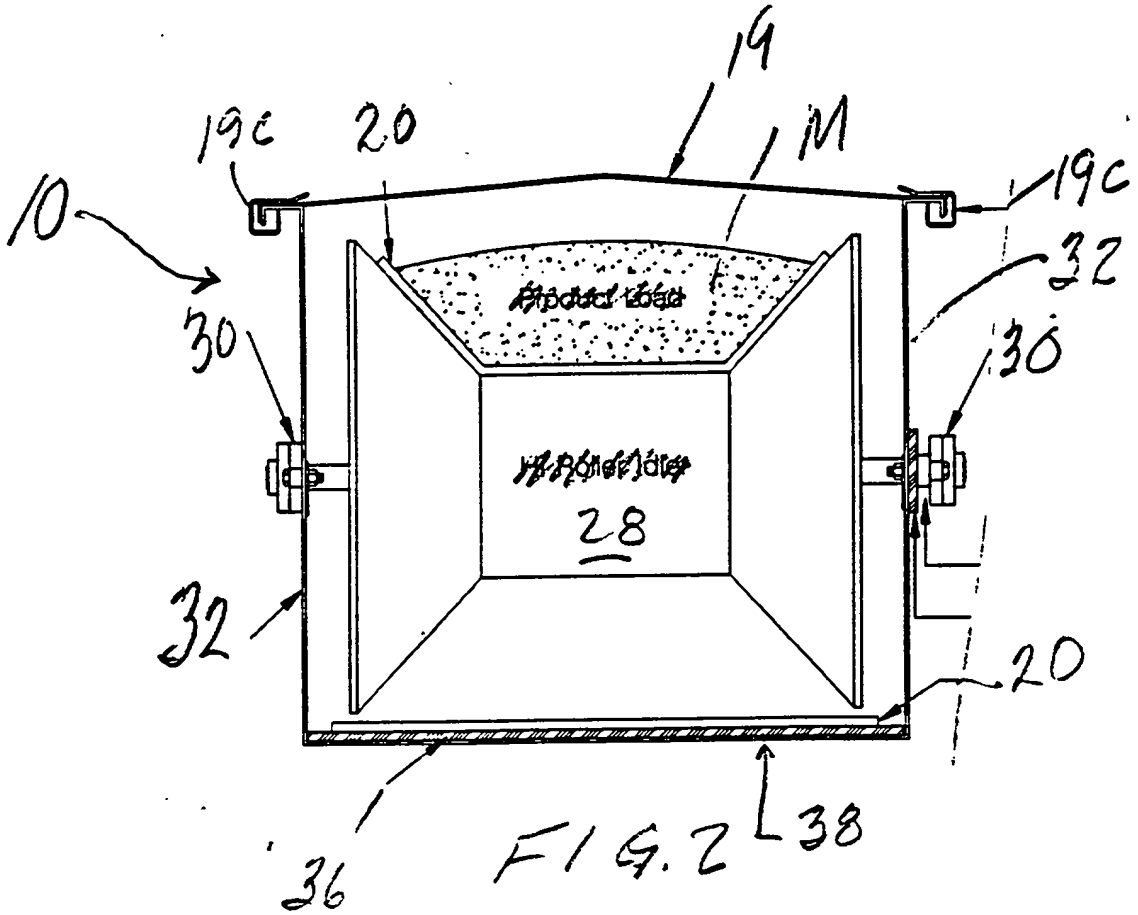


FIG. 2
PRIOR ART

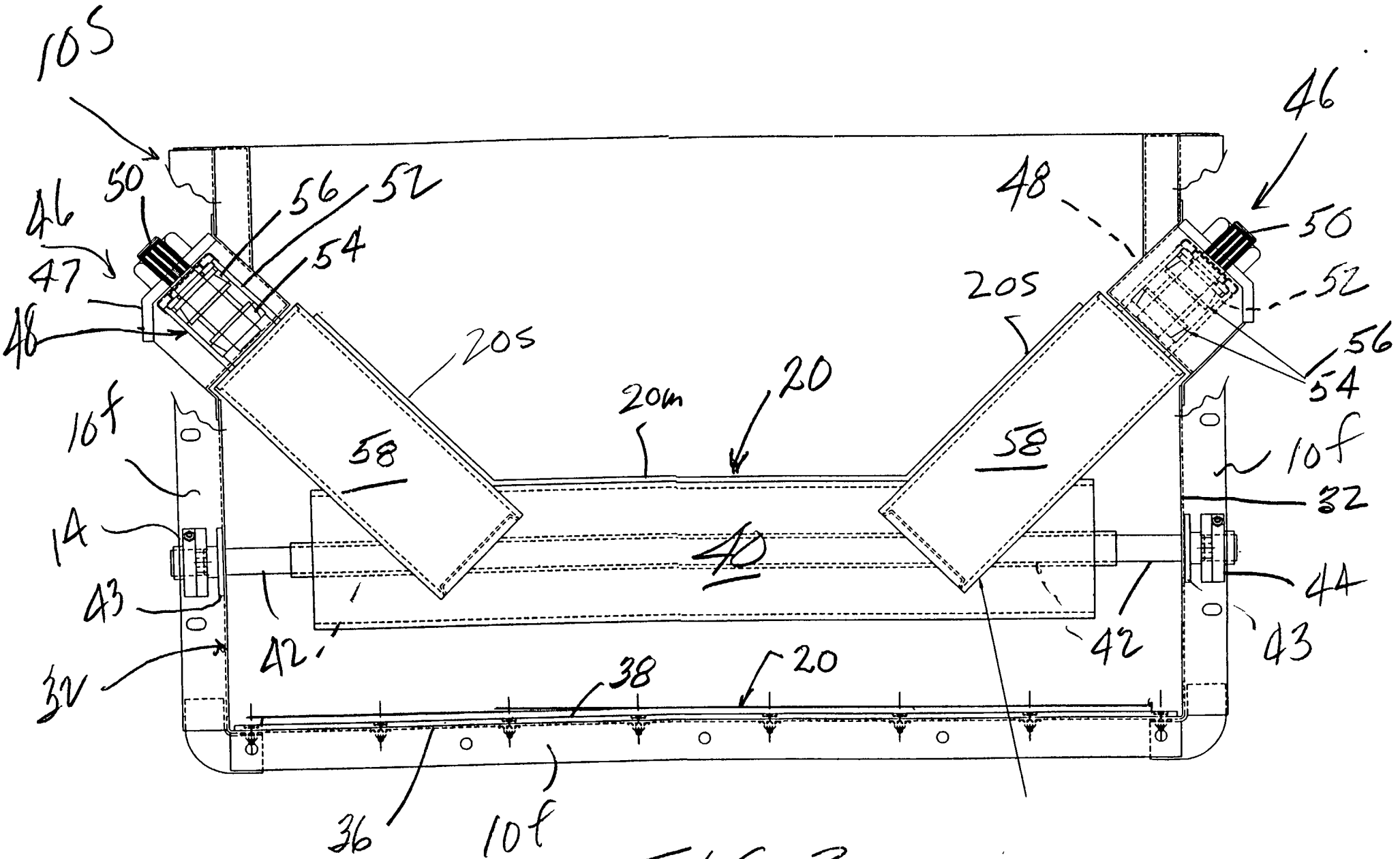
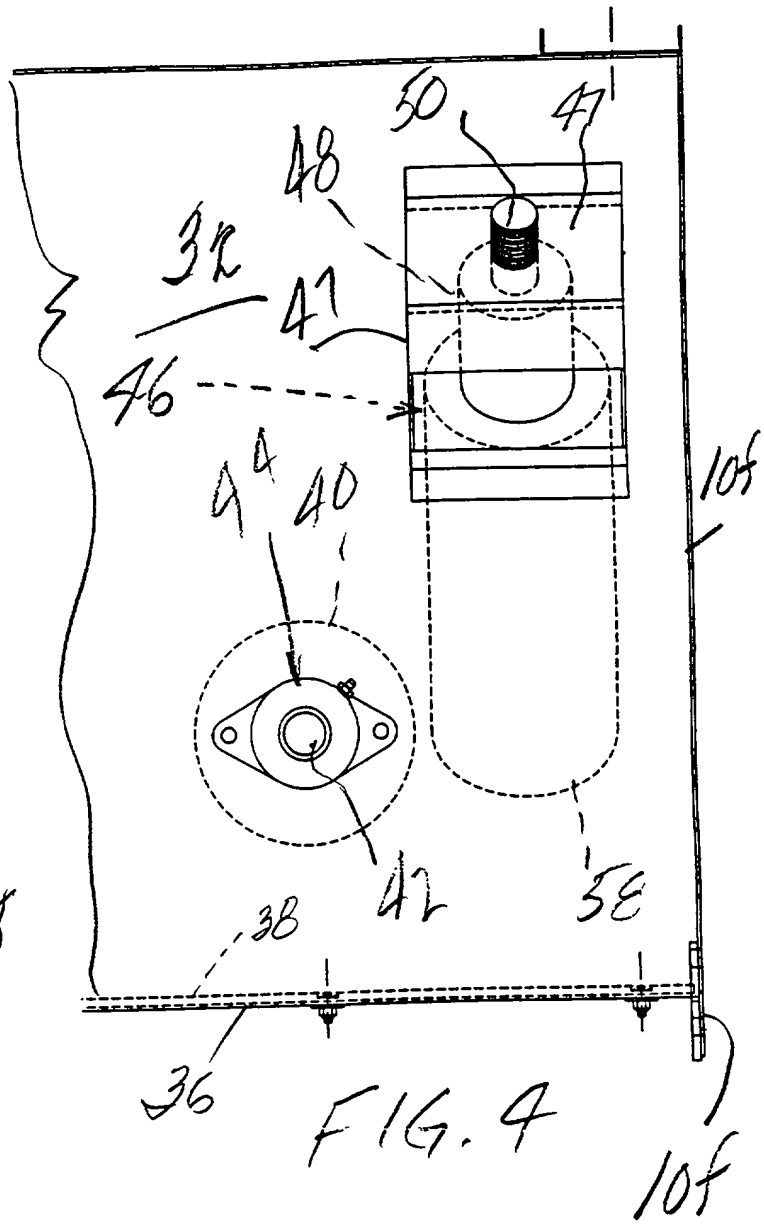


FIG. 3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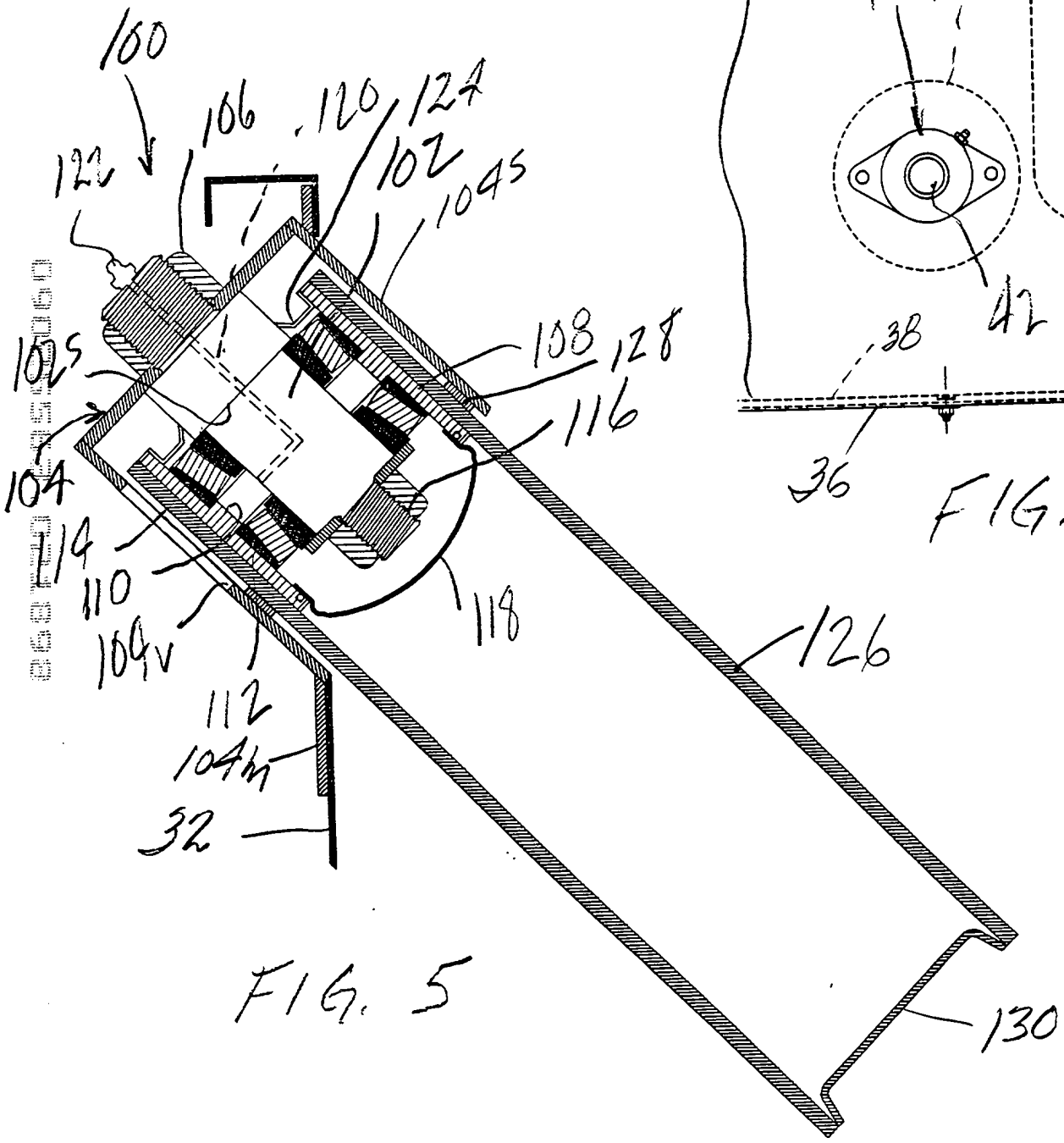
47
46
44
40
10f
42
38
36
10f

FIG. 4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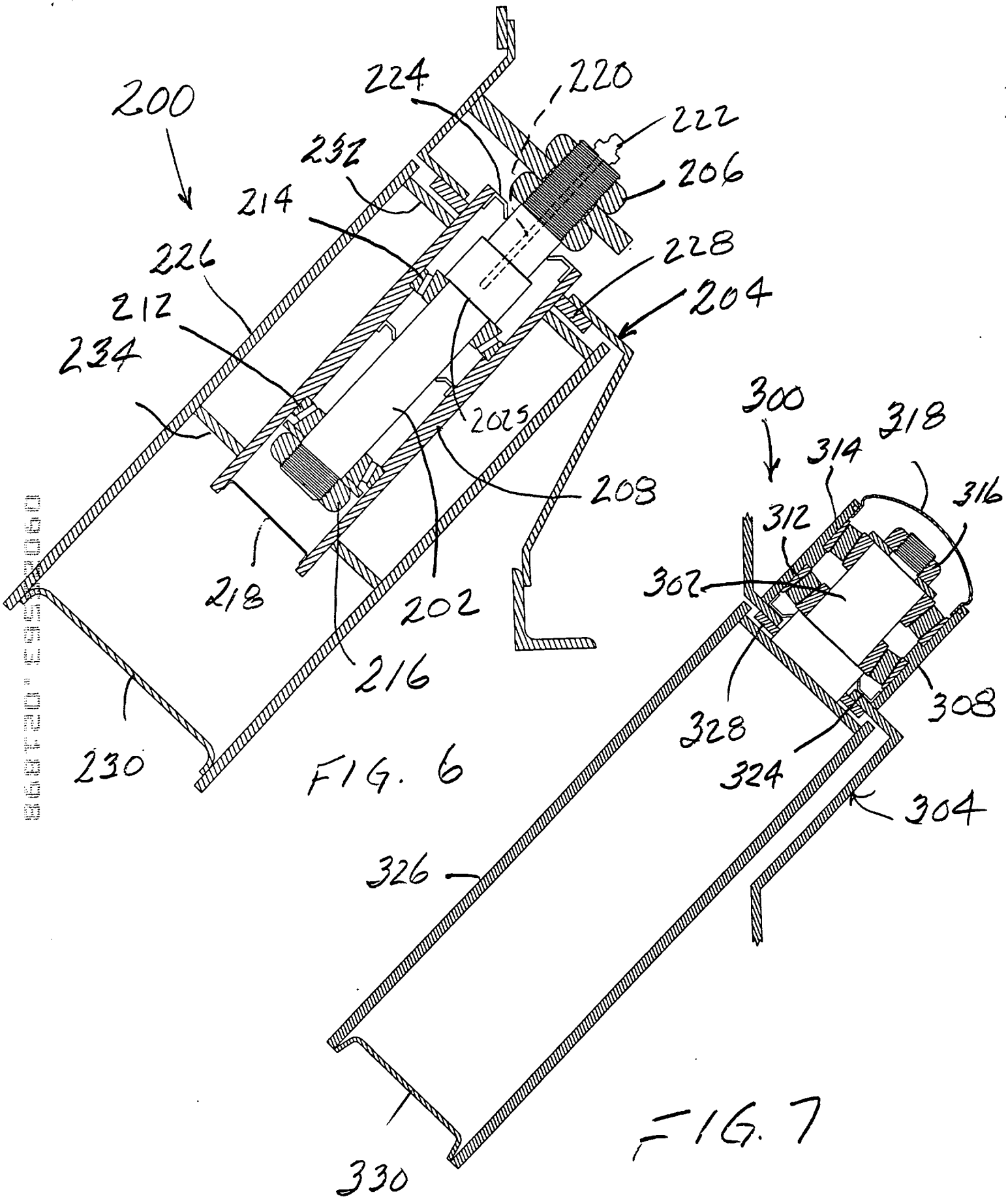
106
120
124
122
102
104s
102s
108
128
116
104
114
110
104v
118
126
112
104h
32
130

FIG. 5


200
224
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214
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228
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212
234
202S
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FIG. 6
300
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FIG. 7